Applied Mathematics I

Prerequisite: Mastery of Pre-Algebra

Course Description

Applied Mathematics I is targeted but not restricted to students who are working toward technical training or college entrance. This course may be the last algebra class for these students before entering their technical training. Applied Mathematics I contains the same concepts as an elementary algebra course, with necessary extensions that prepare students for future technical training. This course will allow students to develop skills in recognizing, organizing, and using patterns, functions, and formulas. There is a strong emphasis on lab activities that demonstrate how algebraic concepts solve real-world linear and quadratic problems. These lab activities are a critical requirement of this course and must be implemented in order to teach for deep understanding rather than to a strictly memorized algorithmic approach. To help develop proficiency in symbolic and graphic representations, students will use physical models, visual models, and technology. This course may be taught with the individual CORD Applied Mathematics units (units 14–26) or the hardbound editions of *CORD Algebra 1* published by CORD Communications. After successfully completing Applied Mathematics I, a student is prepared for either Applied Mathematics II, which is an applied approach to geometry, or a traditional geometry course.

Applied Mathematics I

Standard 1: Students will acquire number sense and perform operations with real numbers.

Objective 1.1: Compute fluently and make reasonable estimates.

a. Evaluate and simplify numerical expressions containing real numbers using the order of operations.
b. Compute solutions to problems and determine the reasonableness of an answer by relating them to the problem.

Objective 1.2: Represent real numbers in a variety of ways.

a. Compare and order real numbers.
b. Choose appropriate and convenient forms of real numbers for solving problems and representing answers, e.g., radical form, multiples of pi, decimal, fraction, or percent.

Objective 1.3: Identify relationships among real numbers and operations involving these numbers.

a. Classify numbers as rational or irrational in the real number system.
b. Relate properties and operations of rational numbers to those used with irrational numbers.

Standard 2: Students will represent and analyze mathematical situations and properties using patterns, relations, functions, and algebraic symbols.

Objective 2.1: Use patterns, relations, and functions to represent mathematical situations.

a. Distinguish between linear and non-linear functions when given a table, equation, or graph.
b. Represent linear equations in slope-intercept form, $y = mx + b$, or standard form, $Ax + By = C$.
c. Write algebraic expressions describing numerical patterns or relations.
d. Determine whether a relation is a function when given a graph or set of ordered pairs.
e. Identify the slope of a linear function as an average rate of change in real-world situations.

Objective 2.2: Evaluate, solve, and analyze mathematical situations using algebraic properties and symbols.

a. Simplify and evaluate numerical expressions (including integer exponents and square roots), algebraic expressions, formulas, and equations.
b. Solve multi-step linear equations and inequalities:
   - Numerically; e.g., from a table.
   - Algebraically; e.g., including the use of manipulatives.
   - Graphically.
   - Using technology.
c. Solve systems of two linear equations and inequalities:
   - Numerically, e.g., from a table.
   - Algebraically.
   - Graphically.
   - Using technology.
d. Determine the number of possible solutions for a system of two linear equations.
e. Solve proportions that include algebraic first-degree expressions.
f. Solve linear formulas and literal equations for a specified variable, e.g., solve for p in $I = prt$.
g. Solve real-world problems involving constant rates of change, e.g., distance, rate and time, hourly wages, rates of interest.
h. Determine whether two lines are parallel, perpendicular, or neither when given the equations.

Objective 2.3: Represent quantitative relationships using mathematical models and symbols.

a. Write the equation of a line given:
   - A set of ordered pairs.
   - The slope and a point on the line.
   - The graph of a line.
b. Graph linear relations and functions:
   - By plotting points.
   - By finding x- and y-intercepts.
   - Using the slope-intercept form of a line.
   - Using the slope and any point on the line.
c. Identify the domain and range of a relation or function when given a graph, equation, table, or set of ordered pairs.
d. Identify horizontal and vertical lines given their equations.
e. Determine the effect of parameter changes on the graphs of linear relations and functions.
f. Identify the x- and y-intercepts from an equation or graph of a line or a table of values.
g. Determine the slope of a line when given:
   - A set of ordered pairs.
   - The graph of a linear relation or function.
   - The equation of a linear relation or function.
   - A table of values.
h. Solve and graph a system of linear inequalities and identify the boundary lines and solution area.
i. Determine and explain the meaning of intercepts using real-world examples.
j. Use direct variation to model rates of change, e.g., if income = 40 hours times rate of pay, then increasing the rate of pay increases income.

Standard 3: Students will solve problems using spatial and logical reasoning, applications of geometric principles, and modeling.		
.	Objective 3.2: Specify locations and describe spatial relationships using coordinate geometry. a. Find the distance between two given points and find the coordinates of the midpoint between them. b. Solve problems using the distance formula. c. Solve problems for areas and perimeters. d. Solve problems for areas and circumferences of circles.	Objective 3.3: Solve problems using visualization, spatial reasoning, and geometric modeling. a. Solve problems using the Pythagorean Theorem. b. Find missing parts of geometric figures using proportional reasoning and geometric relationships. c. Multiply polynomials using the distributive property, area models, and other methods, e.g., $(a + b)^2$, a(a+ 2), or (x + a)(x + b). d. Factor polynomials using a variety of methods. • To identify the greatest common monomial factor. • Of the form $ax^2 + bx + c$ when a = 1.
Standard 4: Students will understand and apply measurement tools, formulas, and techniques.		
Objective 4.1: Understand measurable attributes of objects and the units, systems, and processes of measurement. a. Measure lengths of designated sides of geometric figures and calculate area and volume using the correct units. b. Calculate derived measures using formulas, e.g., areas, volumes, surface areas. c. Express the rate of change as a ratio of two different measures. d. Convert unit measures within a system, e.g., feet to inches, liters to milliliters. a. Use a variety of estimation strategies to determine the reasonableness of answers.		
Standard 5: Students will draw conclusions using concepts of probability, after collecting, organizing, and analyzing a data set.		
Objective 5.1: Formulate and answer questions by collecting, organizing, and analyzing data. a. Collect, record, organize, and display a set of data. b. Determine whether the pattern of the data is linear or nonlinear when given in a list, table, or graph. c. Find a line of best fit by estimation, choosing two points, or using technology for a given set of data. d. Interpret the correlation between two variables as positive, negative, or having no correlation. e. Find mean, median, mode, and range for a data set. f. Make predictions based n a line of best fit. g. Analyze the meaning of the slope and y-intercept of a line of best fit as it relates to the data.	Objective 5.2: Apply basic concepts of probability. a. Determine and express the probability of an event as a fraction, percent, ratio, or decimal. b. Determine whether a game or process is fair. c. Compute simple probabilities using the Fundamental Counting Principle or a tree diagram. d. Identify the probability of an event as being between zero (event not possible) and one (event certain). e. Recognize that the sum of the probability of an event and the probability of its complement is equal to one.	